

REMARKS/ARGUMENTS

Application Status

The status of the application is as follows:

- The disclosure is objected to because section headings are missing.
- Claims 1-22 are currently pending.
- Claims 1-2, 5, 9, 11-13, 16 and 22 stand rejected under 35 U.S.C. 102(b) as anticipated by Schaaf (US 6111933).
- Claims 1-2, 5-6, 11-13, 16 and 22 stand rejected under 35 U.S.C. 102(b) as anticipated by Gard (US 5550889).
- Claim 10 stands rejected under 35 U.S.C. 103(a) as obvious over Schaaf in view of Mika (US 5748701).
- Claims 3-4, 7-8, 14-15, 17, and 20-21 are objected to as being dependent on a rejected base claim, but would allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The Examiner is thanked for the indication that these claims are directed to allowable subject matter.
- Although the Office Action Summary indicates that claims 18 and 19 stand rejected, the Detailed Action does not indicate that the claims are rejected, nor does it include any grounds for such a rejection. Consequently, Applicant assumes that the Office Action Summary contains a typographical error and that claims 18 and 19 are directed to allowable subject matter.

Objection to the Specification

Applicant respectfully traverses the objection to the specification due to the lack of section headings. Applicant submits that subject headings are merely suggestive in nature and are not required under 37 CFR 1.77(b). In light of this, Applicant has not amended the specification to include subject headings. Reconsideration and withdrawal of the objection to the specification are respectfully requested.

Claim Rejections – 35 USC 102 – Schaaf Reference

Claims 1-2, 5, 9, 11-13, 16, and 22 are rejected as being anticipated by Schaaf.

Independent claim 1

Claim 1 requires, *inter alia*, “a cathode including a filament that generates electrons that are focused into a beam.” The Office Action points to Schaaf reference numeral 13¹ as meeting this requirement. This contention is respectfully traversed. While Schaaf discloses a cathode 13, it is silent as to a cathode “including a filament that generates electrons that are focused into a beam.”

According to MPEP 2131, “[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a prior art reference.” Moreover, the “identical invention must be shown in as complete detail as is contained in the claim.”²

MPEP 2112 recognizes that “[t]he fact that a certain result or characteristic may be present in the prior art is not sufficient to establish the inherency of that result or characteristic. . . . To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing being described in the reference, and that it would be so recognized by one of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.” Should the Examiner wish to rely on a theory of inherency, “the examiner must provide a basis in fact and/or technical reasoning to support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.”³

While Schaaf discloses a cathode 13, it is silent as to a cathode including “a filament that generates electrons that are focused into a beam.” The Office Action also fails to allege that these aspects are inherent in Schaaf. Moreover, and as explicitly

¹ Note that the office action refers the cathode 14. Schaaf’s reference numeral 14 is the anode. It is believed that the reference to 14 was a typographical error and was intended to refer to numeral 13.

² MPEP 2131; *see also* 706.02(IV.)

³ MPEP 2112(IV.) (emphasis in original).

required by the MPEP, the Office Action fails to provide any technical reasoning to support a determination that the invention of claim 1 necessarily flows from the teachings of Schaaf. Consequently, the rejection of claim 1 as being anticipated by Schaaf should be withdrawn.

Dependent claim 2

It is submitted that **claim 2** is directed to allowable subject matter at least by virtue of its dependency from claim 1.

Dependent claim 5

Claim 5 requires, *inter alia*:

- a rotating gantry on which the x-ray tube is disposed. The rotating gantry defines an examination region into which the x-ray tube transmits an x-ray beam.
- a two-dimensional x-ray detector arranged across the examination region from the x-ray tube that measures a spatially varying intensity of the x-ray beam after the x-ray beam passes through the examination region.
- a processor that reconstructs a computed tomographic image of an imaging subject disposed in the examination region based on the spatially varying intensity of the x-ray beam measured by the x-ray detector at a plurality of positions of the x-ray source.

To meet these requirements, the Office Action points -- without further explanation -- to Schaaf column 6 line 22, which merely states that the “point of incidence of the electrons on the anode 14 can be shifted a few millimeters, as is done particularly for computer tomography.” Though Schaaf refers computer tomography, it is silent as to the limitations of claim 5.

It is respectfully submitted that the Office Action has failed to show that Schaaf teaches every aspect of the claimed invention. It will also be appreciated that the legal requirements outlined above in relation to claim 1 apply *mutatis mutandis* to claim 5. Consequently, the rejection of claim 5 as being anticipated by Schaaf should be withdrawn.

Dependent claim 9

Claim 9 requires, *inter alia*:

- at least on electrostatic control electrode arranged to electrostatically reduce an intensity of the electron beam;
- a biasing means for applying a time-varying electrical bias to the electrostatic control electrode to vary the intensity of the electron beam; and
- paired grid electrodes arranged on opposite sides of the filament. The electrostatic control modulator additionally applies a switched differential electrical bias component applied to the grid electrodes that causes a wobbling of the electron beam.

Regarding the electrostatic control electrode and biasing means, the Office Action points to the embodiment of Schaaf Figure 3, and more particularly to control electrodes 15, 22, 23 and column 5 line 23+. Regarding the paired grid electrodes and the electrostatic control modulator, the Office Action points to the embodiment of Schaaf Figure 4.

As noted above, anticipation requires that each and every element as set forth in the claim be found in a single prior art reference. In addition, and as acknowledged by MPEP 2131.01, "the elements must be arranged as required by the claim."⁴

Schaaf Figure 3 and Figure 4 are directed to two distinct embodiments of Schaaf's apparatus, neither of which include all of the features relied upon by the Office Action to reject claim 9. At least because Schaaf fails to disclose or suggest that the various elements be arranged as required by the claim, it is submitted that the rejection of claim 9 is improper.

Consequently, the rejection of claim 9 as being anticipated by Schaaf should be withdrawn.

Dependent claim 11

Claim 11, which depends from claims 1 and 10, requires *inter alia*:

- that the electrostatic control electrode include a Wehnelt cylinder; and
- an electromagnetic deflector.

⁴ MPEP 2131.01.

Schaaf does not disclose –nor does the Office Action allege that Schaaf discloses – a Wehnelt cylinder.

Consequently, it is respectfully submitted that the rejection of claim 11 as being anticipated by Schaaf should be withdrawn.

Dependent claim 12

It is submitted that **claim 12** is directed to allowable subject matter at least by virtue of its dependency from claim 1.

Independent claim 13

Independent **claim 13** requires “a cathode having a filament that generates electrons which are focused into a beam.” The Office Action asserts without explanation that this requirement is disclosed by Schaaf. This assertion is respectfully traversed, and the remarks set forth above in connection with claim 1 apply, *mutatis mutandis*, to claim 13.

Consequently, the rejection of claim 13 as being anticipated by Schaaf should be withdrawn.

Dependent claim 16

Dependent **claim 16** requires “synchronizing the applying of the time-varying electrical bias with a rotation of a rotating gantry of a computed tomography apparatus on which the x-ray tube is arranged.”

The Office Action asserts, without explanation, that Schaaf discloses the requirements of claim 16. This contention is respectfully traversed.

Moreover, the Office Action fails to establish a *prima facie* case of anticipation because it does not identify which features of the prior art correspond to the claimed elements and limitations. To meet the burden of establishing a *prima facie* case of anticipation, the Office must explain how the rejected claims are anticipated by pointing out where the specific limitations of the claims are found in the prior art. *Ex Parte Naoya Isoda*, Appeal No. 2005-2289, Application 10/064,508 (Bd. Pat. App. & Inter.2005). The goal of examination is to clearly articulate any rejection early in the prosecution process so that the applicant has the opportunity to provide evidence of patentability and otherwise reply completely at the earliest opportunity. (MPEP §706). The pertinence of

each reference, if not apparent, must be clearly explained and each rejected claim specified. (37 C.F.R. §1.104(c)(2)).

Should the Examiner elect to re-assert the rejection of claim 16, Applicant requests specific identification of each feature or element in Schaaf that is believed to correspond to the claimed elements and limitations, and if possible the location in the cited reference where the relevant feature or element is discussed. Applicant further requests a full opportunity to respond to a non-final rejection.

Dependent claim 22

Claim 22, which depends from claim 1, requires a biasing means for applying a time-varying electrical bias to the electrostatic control electrode to vary the intensity of the electron beam. The time varying electrical bias applied to the electrostatic control electrode is an analog time varying electrical bias.

The Office Action asserts that the claimed features are disclosed by Schaaf, apparently pointing to Schaaf's abstract and column 5 line 23+ as cited in connection with claim 1. This assertion is respectfully traversed as Schaaf teaches a digital bias, not the analog bias required by claim 22.

Schaaf teaches that the x-ray tube 12 includes a grid 15 for controlling the tube current.⁵ However, Schaaf teaches that the bias applied to the grid 15 is a digital bias for switching the tube current between to binary states:

The current flowing through the x-ray tube 12 can be switched *on and off* by means of a voltage applied to the grid 15.⁶

* * *

The particular advantage of this embodiment resides in the fact that it is not necessary to switch the high-voltage supply for the cathode and the anode *on and off* in order to switch the tube current *on and off* because the switching *on and off* of the tube current is controlled by the grid voltage.⁷

⁵ Schaaf column 5 lines 25-27.

⁶ Schaaf column 5 lines 38-40 (emphasis added).

⁷ Schaaf column 5 line 64 to column 6 line 2 (emphasis added).

To this end, the grid 15 is switched between a first value of a about -3kV relative to the cathode potential to switch the tube current off and a second value that is slightly less than the cathode voltage to switch the tube current on.⁸

As Schaaf thus fails to teach the analog time-varying electrical bias required by claim 22, the present rejection should be withdrawn.

Claim Rejections – 35 USC 102 – Gard Reference

Independent claim 1

Claim 1 requires, *inter alia*:

- at least one electrostatic control electrode arranged to electrostatically reduce an intensity of the electron beam; and
- a biasing means for applying a time-varying electrical bias to the electrostatic control electrode to vary the intensity of the electron beam.

The Office Action asserts that the Gard's deflection coil 41 teaches the claimed electrostatic control electrode and that the claimed biasing means is taught by Gard's variable current power supply 40 and wobble input. These assertions are respectfully traversed.

Gard discloses an x-ray tube for use in a computed tomography (CT) system. According to Gard, a solenoidal deflection coil 41 is mounted near the path of an electron beam 42 produced in an x-ray tube 13. To align the focal spot position, the deflection coil 41 produces a magnetic field which acts on the electron beam. A variable current power supply 40 drives the deflection coil 41 and is controlled by input signals to align the focal spot at a static reference position, to correct for focal spot drift between scans, and to wobble the focal spot position during a scan or between scans.⁹

Claim 1 requires at least one electrostatic control electrode arranged to electrostatically reduce an intensity of the electron beam. In contrast, Gard discloses an deflection coil 41 that produces a magnetic field that acts on the electron beam.

⁸ Schaaf column 5 lines 38-43.

⁹ Gard Figures 3 and 4, Abstract, column 3 line 16+.

Moreover, Gard's deflection coil 41 serves to deflect or align the electron beam, not to electrostatically reduce its intensity as required by claim 1.¹⁰

Claim 1 also requires a biasing means for applying a time-varying bias to the electrostatic control electrode to vary the intensity of the electron beam. As Gard lacks an electrostatic control electrode that varies the intensity of the electron beam, Gard also lacks a means for performing the function recited by claim 1.

Consequently, the rejection of claim 1 as being anticipated by Gard should be withdrawn.

Dependent claim 2

Claim 2 requires that the electrostatic control electrode include an electrostatic grid with grid electrodes arranged for steering the electron beam in response to an applied differential potential.

The Office Action asserts that the claimed electrostatic grid is taught by Gard's deflection coil 41. This assertion is respectfully traversed. Gard's deflection coil 41 is a solenoidal electromagnetic deflection coil rather than the electrostatic coil with grid electrodes as recited in claim 2. Moreover, Gard teaches that the movement of the electron beam is determined by the direction of current flow through the deflection coil and not by an applied differential potential as required by claim 2.¹¹

Consequently, the rejection of claim 2 as being anticipated by Gard should be withdrawn.

Dependent claim 5

It is submitted that **claim 5** distinguishes over Gard at least by virtue of its dependency from claim 1.

Dependent claim 6

Dependent **claim 6** requires, *inter alia*, that the electrostatic control electrode include an electrostatic grid with grid electrodes arranged about the filament.

To support the rejection, the Office Action points to Gard Figure 3 and column 3 lines 16+. As described above with respect to claim 1, however, Gard teaches a

¹⁰ Gard column 3 lines 27-57.

¹¹ Gard column 3 lines 27-57.

solenoidal deflection coil 41, not an electrostatic grid as required by the claim 16. Moreover, Gard's solenoid deflection coil 41 cannot fairly be characterized as disclosing a grid electrodes arranged about the filament.

Consequently, the rejection of claim 6 as being anticipated by Gard should be withdrawn.

Dependent claim 11

Dependent **claim 11**, which depends from claim 1, requires, *inter alia*:

- at least one electrostatic control electrode arranged to electrostatically reduce an intensity of the electron beam;
- a biasing means for applying a time-varying electrical bias to the electrostatic control electrode to vary the intensity of the electron beam; and
- an electromagnetic deflector that selectively deflects the electron beam.

The Office Action asserts that the claimed electromagnetic deflector is disclosed at Gard Figure 3.

In rejecting claim 1, however, the Office Action has already asserted that the solenoidal deflection coil 41 shown in Gard Figure 3 serves as the claimed electrostatic control electrode, and that the power supply 40 and wobble input shown in Gard Figure 3 serves as the claimed bias means for varying the intensity of the electron beam.

As will be appreciated, however, Gard's solenoidal coil 41 cannot fairly be alleged to serve as both the claimed electrostatic control electrode and the claimed electromagnetic reflector as recited in claim 11. Accordingly, the rejection of claim 11 as being anticipated by Gard should be withdrawn.

Dependent claim 12

It is submitted that dependent **claim 12** is directed to allowable subject matter at least by virtue of its dependency from claim 1.

Independent claim 13

Independent **claim 13** is directed to a method of dose-modulating an output of an x-ray tube that includes an electrostatic control electrode that electrostatically adjusts an intensity of the electron beam. The method includes applying a time-varying electrical

bias to the electrostatic control electrode to produce a first time-varying intensity modulation of the electron beam.

The Office Action asserts that the limitations of claim 13 are satisfied by Gard Figure 3 and column 3 lines 16+. As described above in connection with claim 1, however, Gard's apparatus includes a solenoidal coil 41, and not the electrostatic control electrode recited in claim 13. Moreover, Gard's deflection coil 41 generates a magnetic flux that serves to deflect the electron beam, not to electrostatically reduce its intensity as required by claim 13. Further, Gard fails to disclose the application of a time varying bias to an electrostatic control electrode to produce a time varying intensity of the electron beam.

Accordingly, the rejection of claim 13 as being anticipated by Gard should be withdrawn.

Dependent claim 16

Dependent **claim 16** requires "synchronizing the applying of the time-varying electrical bias with a rotation of a rotating gantry of a computed tomography apparatus on which the x-ray tube is arranged."

The Office Action asserts that the requirements of dependent claim 16 are disclosed at Gard Figure 2. This contention is respectfully traversed.

More specifically, Gard Figure 2 merely depicts a block schematic diagram of a CT imaging system. It is submitted that Figure 2, and Gard in general, fails to disclose or suggest the step of synchronizing as more fully recited in claim 16. In addition, the arguments set forth above in connection with the rejection of claim 16 over Schaaf are equally applicable to the present rejection.

Accordingly, the rejection of claim 16 as being anticipated by Gard should be withdrawn.

Dependent claim 22

It is submitted that **claim 22** is directed to allowable subject matter at least by virtue of its dependency from claim 13.

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Claim Rejections – 35 U.S.C. 103

Dependent claim 10

It is submitted that **claim 10** is directed to allowable subject matter at least by virtue of its dependency from claim 1.

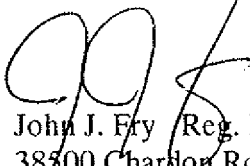
Allowable Subject Matter

The Examiner is thanked for the indication that **claims 3-4, 7-8, 14-15, 17, and 20-21** are directed to allowable subject matter. As noted above, it is also assumed that, absent any grounds for rejection, **claims 18 and 19** are directed to allowable subject matter.

Conclusion

In view of the foregoing, it is submitted that claims 1-22 distinguish patentably and non-obviously over the prior art of record. An early indication of allowability is earnestly solicited.

Respectfully submitted,
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